Host: Welcome to the SEE Podcast, presented by the American Society of Anesthesiologists. SEE, translating emerging anesthesia knowledge for your daily practice.

Natalie F. Holt, MD, MPH: Hello, and welcome to Volume 36B of the SEE program. My name is Natalie Holt, and I am one of the members of the SEE editorial board.

For those of you who aren’t familiar with the program, SEE is a continuing medical education product offered by the American Society of Anesthesiologists. The purpose of SEE is to keep readers informed about emerging knowledge in the scientific literature and how it might impact the practice of anesthesiology. In each edition, we choose a hundred articles from over 30 leading professional journals, with the goal of highlighting emerging knowledge in our specialty. Today, I would like to give you a preview of a few of the articles from this latest edition.

Many of us have spent the past several months learning about and caring for patients with COVID-19. In this Volume, we highlight a few newly published articles sharing evolving information about the SARS-CoV-2 virus. The first, by Greenland et al, reviews pathogenesis, presentation, diagnosis, and potential therapeutics, with a focus on management of COVID-19-associated respiratory failure. Similar to some other coronaviruses, SARS-CoV-2 seems to use the angiotensin-converting enzyme-2 (or ACE2) as a receptor. This receptor is found in the lower respiratory tract, small intestines, vascular endothelium, and cardiac myocytes—sites in which clinical manifestations of COVID-19 are most prominent. Interestingly, both ACE inhibitors and angiotensin-receptor blockers (or
ARBs) increase ACE2 expression. Although increased ACE2 expression may impact the clinical picture of SARS-CoV-2, current recommendations from the American College of Cardiology and American Heart Association are to continue ACE inhibitors or ARBs in patients who are already on these medications. Among the most promising therapeutics for COVID-19 is the antiviral drug remdesivir. However, treatment is mostly supportive and follows the ARDS-NET protocol.

Unfortunately, patients who develop severe respiratory illness due to COVID-19 often require intubation. Given the aerosol-generating nature of intubation and the fact that the SARS-CoV-2 virus spreads mainly through respiratory droplets, anesthesia providers are particularly at risk of being exposed to the virus during airway management. A respirator and eye protection are essential components of personal protective equipment. The goal should be to intubate the patient in the shortest amount of time and in a way that generates the least aerosol. Current guidelines suggest a modified rapid sequence approach with no or minimal small tidal volume mask ventilation prior to intubation. Video laryngoscopy has been advocated, as it increases the distance between the provider and the airway and may increase the first-pass intubation success rate. It has also been suggested that patients who have tested positive for SARS-CoV-2 have viral colonization reduced using preprocedural chlorhexidine wipes, nasal povidone iodine swabs, and chlorhexidine mouth rinse.

Though much effort has been devoted to COVID-19, researchers continue to tackle other interesting topics in anesthesia. For example, in the field of cardiac surgery, there has been ongoing debate about whether volatile anesthetics are superior to total intravenous anesthesia (or TIVA) among patients undergoing coronary artery bypass graft surgery. Although volatile anesthetics have been shown to have cell-protective effects and decrease biomarkers of myocardial injury, trials investigating the impact of anesthetic technique on outcomes have produced mixed results. The MYRIAD study was designed to shed further light on this topic. This was a
multicenter trial involving over 5,000 patients randomized to either volatile anesthetics or TIVA for cardiac bypass graft surgery and followed for a year postoperatively. The authors found no difference in 30-day mortality or long-term survival, nor in myocardial infarction risk, hospital readmission rate, or length of hospital stay. It may be that other factors that affect outcomes overshadow the significance of anesthetic technique.

The prevention of cardiac complications among patients undergoing noncardiac surgery has been a long-standing topic in perioperative medicine. In 2015, the CTA VISION study showed that the degree of preoperative coronary artery disease as found on coronary CT angiography correlated with the risk of perioperative myocardial infarction or cardiovascular death. More recently, the same group of investigators conducted a retrospective analysis to evaluate the interaction between coronary CT angiographic findings and perioperative hypotension on the composite outcome of time to myocardial infarction or cardiovascular death up to 30 days after surgery. The study included nearly a thousand patients aged 45 years and older who were at risk of coronary artery disease [CAD] or congestive heart failure and were undergoing elective inpatient noncardiac surgery. They found that both perioperative hypotension – defined as systolic blood pressure below 90 mm Hg sustained for at least 10 minutes – and degree of CAD on CT angiography were independently associated with an increased risk of perioperative cardiovascular death and MI. With neither risk factor, the rate of cardiovascular events was 2.7%. With either prolonged hypotension or obstructive CAD, the rate of cardiovascular events was approximately 6% to 8%. With both risk factors, the rate of cardiovascular adverse events was 16%. The association between hypotension and cardiovascular events was observed even in patients without obstructive CAD and was not significantly different among patients with different levels of CAD severity. The results suggest that prevention and treatment of perioperative hypotension should be undertaken regardless of the presence or absence of CAD.
The management of pain is a cornerstone of anesthesia practice; however, our knowledge of pain remains rudimentary. Currently, there are only subjective measures such as the visual analog or numeric rating scale to measure pain and the effects of interventions. Recently, a group of researchers sought to evaluate whether beta-endorphin levels could be used as a surrogate marker for chronic low back pain and response to treatment interventions. The authors pooled results of 7 trials involving 375 patients undergoing noninterventional pain treatments such as electroacupuncture and auricular point pressure. They found that changes in visual analog scores were well-correlated with changes in beta-endorphin levels. Furthermore, patients who underwent pain management procedures showed increases in beta-endorphin levels, while those who underwent sham procedures did not. Although much research remains to be done, this study offers some hope that objective measures of pain treatment may be available in the not-too-distant future.

Transfusion of blood products is a primary treatment modality for patients who have significant blood loss. Although allogeneic blood products remain the mainstay of treatment, clinical trials of novel blood substitutes aimed at improving oxygen-carrying capacity have been conducted throughout the past several decades. Hemopure is currently the only hemoglobin-based oxygen carrier available for use in the United States through the Food and Drug Administration expanded access program. This product consists of purified bovine hemoglobin diluted in a modified lactated Ringer’s solution. Administration of this product has been shown to reduce transfusion requirements. A serious potential side effect is methemoglobinemia. In addition to anemia, potential indications for these oxygen carriers are as a treatment for sickle cell anemia, to promote regional vasodilation in the context of cerebral ischemia, and as an additive to solutions for organ preservation.

If you work at a teaching hospital, you’re probably familiar with the practice of surgeons scheduling overlapping procedures. In overlapping surgeries, the critical
portion of a procedure is performed by a senior physician, and the noncritical portions are finished by a resident or fellow. Although allowing for graduated responsibilities is an important aspect of trainee education, there have been concerns about the safety of this practice for patients. A recent, multicenter collaborative study analyzed the effect of overlapping surgical procedures on surgical length, immediate perioperative outcomes, and in-hospital mortality. The investigators found that in-hospital mortality and complications were not different between low-risk patients undergoing overlapping versus non-overlapping procedures. However, for patients with risk factors and those undergoing coronary artery bypass graft surgeries, in-hospital mortality and complication rates were increased when surgeries were overlapping. This study underscores the importance of patient selection when teaching trainees and scheduling patients.

A fundamental feature of medical practice is the idea of not only continuing to learn about new breakthroughs and methods but also to unlearn old and outmoded practices. One topic in anesthesia for which this principle has been true is the role of perioperative beta-blockers. Once considered protective against cardiovascular complications, more recent evidence suggests their use may cause more harm than good. The authors of a recent cohort study sought to evaluate the effect of perioperative beta-blockers in older, hypertensive patients. Data from the United Kingdom Clinical Practice Research Datalink were used to identify patients 65 years and older who had undergone noncardiac surgery between 2004 and 2013. They found that in older patients with systolic hypertension, preoperative beta-blocker use was associated with an increased odds of postoperative mortality. In contrast, the use of statins or thiazide diuretics preoperatively exerted a protective effect. Although this study has limitations, it adds further support to the notion that preoperative beta-blockers are not helpful—and may actually be harmful—to some patients.
The use of supplemental oxygen is another fundamental of anesthesia practice – particularly for the treatment of patients in shock – that has been called into question. Although additional oxygen is often beneficial, hyperoxia has been associated with the formation of detrimental reactive oxygen species. A pilot randomized clinical trial was recently conducted in adult trauma patients. Patients were randomized to a restrictive or liberal oxygen group. Patients in the restrictive group received the lowest possible oxygen dose to maintain oxygen saturation of 94% or higher. Patients in the liberal group received either a nonrebreather [mask] with 15 L/min of oxygen flow or mechanical ventilation with a fraction of inspired oxygen concentration of at least 80%, designed to keep oxygen saturation at a level of at least 98%. The results showed no difference in major outcomes, including hospital length of stay, rate of sepsis, Glasgow Outcome Scale score at 30 days, or 30-day mortality rate. However, the study did demonstrate that maintaining normoxia is often possible with a more restrictive oxygen supplementation strategy than is commonly employed.

For anesthesiologists who take care of pediatric patients, tonsillectomy is among the most common surgical procedures. And among children undergoing tonsillectomy, respiratory adverse events occur in up to half of these patients. Recently, a group of investigators conducted a randomized trial among nearly 500 children under 8 years of age undergoing tonsillectomy. The goal of the study was to examine whether inhaled albuterol premedication decreased the risk of respiratory adverse events during the perioperative period. Patients were treated with either 2 puffs of albuterol or placebo 20 minutes before surgery. The authors found that after adjusting for other factors, such as age, intraoperative airway management, and severity of obstructive sleep apnea, the odds ratio for the occurrence of perioperative respiratory adverse events in the placebo versus the albuterol group was 2.8. Even though the results might not be relevant to a general pediatric population, they suggest that anesthesia providers may want to consider
the use of preoperative albuterol in children undergoing tonsillectomy, particularly those at higher risk of adverse events, due, for example, to obstructive sleep apnea.

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